

## Section 4B

### Bioconversion Issue Paper

---

#### 4.1 Purpose

The purpose of this paper is to characterize each of the County's current bioconversion programs, provide alternative diversion strategies, and evaluate the strengths and weaknesses of each strategy. The goals of the strategies are to:

1. Increase diversion of materials from the Kekaha Landfill (Landfill);
2. Minimize costs;
3. Promote sustainability;
4. Facilitate the development of small businesses;
5. Further protect the environmental health of the County; and
6. Increase participation.

The strategies recommended for consideration to achieve the bioconversion goals include:

- Retain status quo;
- Expand the a ban on the landfill disposal of non-residential green waste in Kaua'i to include residential waste and the transfer stations;
- Provide additional drop off areas for green waste;
- Establish a curbside collection of green waste;
- Establish a central green waste and organics processing facility to produce mulch and/or compost;
- Facilitate composting of food waste and non-recyclable paper at private composting facilities;
- Establish a curbside collection of mixed organic; and,
- Further develop the "food waste to animal feed," infrastructure.

The composting of animal manures is not an option that is being explored since these materials are not being delivered in any appreciable quantities to the landfill. The existing diversion from the landfill is accomplished by on-site management at the point of generation. This is discussed further in Section, 5, special waste management. The co-composting of sewage sludge and green waste is also discussed in Section 5. Strategies to enhance the County's backyard composting program are presented Section 3, Waste Reduction.

## 4.2 Background

### 4.2.1 County of Kaua'i's 1994 Integrated Solid Waste Management Plan

In 1994, the County prepared an integrated solid waste management plan. Table 4-1 lists the “action items” and recommendations pertaining to recycling/bioconversion and describes what, if any, actions were taken by the County.

Table 4-1  
County of Kaua'i  
1994 ISWMP Action Items and County's Efforts

| Action Item  | County Action  |
|--|--|
| <i>Action Item 3-4:</i> Green Waste Diversion Strategy<br>Recommended that the County establish a special task force to develop a green waste reduction and diversion plan. Should include both generators and managers of green waste from both the public and private sectors. Focus on source reduction/on-site management, as well as off-site management of green wastes.   | Did not establish  |
| <i>Action Item 3-6:</i> Develop processing capacity (for recyclables and organics)   | Commercial establishments developed green waste processing capacity in the years following Hurricane Iniki; County used tub grinder to process green waste and later contracted with the private sector for such grinding. |
| <i>Action Item 3-8:</i> Develop a strategy and schedule for pursuing: <ul style="list-style-type: none"> <li>Green waste mulch for landscaping</li> <li>Co-composting of green waste and animal manure</li> <li>Co-composting green waste and sewage sludge</li> <li>Bio-fuel production from: construction and demolition wastes, excess green waste with C&amp;D waste, and low grade, non-recyclable paper</li> </ul> | Operations to mulch green waste for landscaping are in place. However, the County is not co-composting green waste with animal manure or sewage sludge. The County is not producing bio-fuel from organics.                |

## 4.2.2 Current Waste Diversion

In 2005, the County diverted 11,648 tons of green waste from the landfill. This represents a significant overall green waste diversion rate of approximately 69 percent<sup>1</sup>. Slightly more than 5,300 tons remain in the waste stream that is being disposed at the landfill. NOTE: The tons diverted do not include the diversion of green waste at commercial facilities; the recovery rate will need to be revised after those numbers are received.

## 4.2.3 Existing Green Waste Handling/Processing Facilities

The County provides five locations where residents may drop off their green wastes at no charge. Businesses can drop-off green wastes for a fee. The green wastes drop-off locations include:

- Hanalei Transfer Station
- Kapaa Transfer Station
- Lihue Transfer Station
- Hanapepe Transfer Station
- Kekaha Landfill

The facilities are open during business hours, receiving lawn and tree trimmings, shrubbery, and Christmas trees.

The County contracts with two private firms to provide grinding services, producing mulch which is available for landscaping.

In 2005, a total of 11,648 tons of green wastes were handled by these facilities.

The private sector reported green waste processing... (to be completed when data is available)

Local pig framers currently collect food waste from certain local hotels, restaurants and the County jail to use as feedstock. While the County has been able to track some of the collections, most food collections of this type take place without the County's knowledge. During 2005, the County tracked 672 tons of food waste being reused in this manner.

## 4.3 Strategies for Improving Bioconversion

The following are discussions of bioconversion-related strategies for increasing landfill diversion, the strengths and weaknesses of each strategy, and whether each option has the potential to:

- Increase diversion of materials from the Landfill;

<sup>1</sup> This was calculated by adding total diverted (11,648 tons) and total disposed (5,342 tons) and dividing the sum by the total diverted. The disposed quantity was derived from the recent Kaua'i County Waste Characterization Study.

- Minimize costs;
- Promote sustainability;
- Facilitate the development of small businesses;
- Protect the environmental health of the County; and
- Increase participation.

### 4.3.1 Retain Status Quo

The County's existing bioconversion programs consist of providing the drop-off collection services for green waste, the processing of that green waste into mulch available for landscaping, and the encouragement of home composting through the distribution of home composting bins and public information as well as the provision of training.

The current programs are diverting a significant amount of green waste from the landfill. However, the status quo would not provide for any improvements as they relate to the County's solid waste management goals:

- ☐ Increase diversion of materials from the Landfill;
- ☒ Minimize costs;
- ☐ Promote sustainability;
- ☐ Facilitate the development of small businesses; or
- ☐ Further protect the environmental health of the County; or
- ☐ Increase participation.

#### 4.3.1.1 Strengths and Weaknesses

Table 4-2  
Strengths and Weaknesses of Strategy  
Status Quo

| Strengths   | Weaknesses  |
|---|---|
| <ul style="list-style-type: none"> <li>■ The County's green waste drop-off program is already diverting a significant amount of material from the landfill.</li> <li>■ Would avoid additional costs of new programs.</li> </ul> | <ul style="list-style-type: none"> <li>■ Would not increase diversion</li> <li>■ Might need to increase processing capacities or limit drop-off quantities as the capacity of drop-off sites is reached.</li> <li>■ Would increase costs if processing is increased.</li> <li>■ Could contribute to citizen dissatisfaction.</li> </ul> |

#### 4.3.1.2 Performance/Financial Analysis

According to the Solid Waste Program Financial Model prepared by R. W. Beck for the County, the existing Green Waste program cost \$577,805 in 2005. Based on this cost and the diversion of 11,648 tons of materials, the Green Waste program cost approximately \$49 per ton to operate. For comparison purposes,

**Comment [a1]:** Is something missing here?

#### 4.3.2 Establish a Disposal Ban on Green Waste for Residents and at the Transfer Stations

The County is authorized to establish such a ban on the disposal of green wastes, to keep these materials out of the landfill<sup>2</sup>. Landfill disposal bans are typically enforced at the point where the collection vehicle tips its load – at transfer stations and at the landfill. Disposal bans work best in situations where the need is widely recognized and alternatives to disposal are available. In addition, the cost impacts of such disposal restrictions can have an impact on the success of the effort. Currently, the County bans the landfill disposal of loads from businesses, industries, governments, institutions and other non-residential sources that exceed 20 percent green waste.

If the County were to ban all green waste from the Landfill and the transfer stations, this could help

- ☒ Increase diversion of materials from the Landfill;
- ☐ Minimize costs;
- ☒ Promote sustainability;
- ☒ Facilitate the development of small businesses;
- ☒ Further protect the environmental health of the County; or
- ☒ Increase participation.

Table 4-2 shows the amount of yard waste that would be annually diverted if a yard waste ban was enacted and 100 percent compliance were achieved

<sup>2</sup> Kauai Ordinances, Title VIII, Chapter 21, Article 7, Section 21-7.3

Table 4-2  
Yard Waste Diversion Quantities<sup>3</sup>

| Year | County | North Shore | Kauai | Lihue | Koloa-Poipu-Kalaheo | West Side |
|------|--------|-------------|-------|-------|---------------------|-----------|
| 2005 | 16,990 | 2,700       | 5,560 | 2,790 | 1,620               | 1,620     |
| 2006 | 17,750 | 2,800       | 5,720 | 2,950 | 1,680               | 1,680     |
| 2007 | 18,530 | 2,890       | 5,890 | 3,110 | 1,750               | 1,750     |
| 2008 | 19,350 | 3,000       | 6,063 | 3,280 | 1,820               | 1,820     |
| 2009 | 20,220 | 3,100       | 6,242 | 3,470 | 1,890               | 1,890     |
| 2010 | 21,110 | 3,210       | 6,426 | 3,670 | 1,960               | 1,960     |
| 2011 | 22,040 | 3,330       | 6,617 | 3,880 | 2,040               | 2,040     |
| 2012 | 23,010 | 3,440       | 6,810 | 4,100 | 2,120               | 2,120     |
| 2013 | 24,010 | 3,560       | 7,011 | 4,330 | 2,200               | 2,200     |
| 2014 | 25,080 | 3,680       | 7,217 | 4,580 | 2,290               | 2,290     |
| 2015 | 26,180 | 3,810       | 7,430 | 4,840 | 2,380               | 2,380     |
| 2016 | 27,330 | 4,040       | 7,855 | 5,250 | 2,540               | 2,540     |
| 2017 | 28,520 | 4,080       | 7,874 | 5,400 | 2,580               | 2,580     |
| 2018 | 29,750 | 4,220       | 8,108 | 5,720 | 2,680               | 2,680     |
| 2019 | 31,050 | 4,370       | 8,347 | 6,050 | 2,780               | 2,780     |
| 2020 | 32,440 | 4,520       | 8,592 | 6,400 | 2,890               | 2,890     |

<sup>3</sup> Based on Planning District population projections in Section 2 and an annual generation rate of 0.20 tons per capita.

Table 4-3  
Strengths and Weaknesses of Strategy  
Green Waste Disposal Ban

| Strengths  | Weaknesses   |
|--|--|
| <ul style="list-style-type: none"> <li>▪ Would divert from the landfill a total of approximately 20,000 tons of green waste per year in the near term; up to 32,000 tons of green waste annually by 2020.</li> <li>▪ Would likely lead to increased commercial operations to divert and compost and/or mulch green waste from businesses.</li> <li>▪ Would lead to increased participation.</li> </ul> | <ul style="list-style-type: none"> <li>▪ Could be unpopular, since it is not voluntary.</li> <li>▪ Should not be implemented unless convenient green waste collection systems are available to businesses and residents.</li> <li>▪ Would likely create an immediate increase in quantities brought to the drop-off sites, which may cause capacity problems.</li> <li>▪ Would require additional public information programs to win acceptance of and compliance with ban.</li> <li>▪ Could lead to increased costs for curbside collection of green waste, if such service was provided to service residents who are unable to transport their green waste to diversion points.</li> <li>▪ Would require additional County staff to enforce the ban.</li> <li>▪ Raises the question "If green waste from my neighbor's tree ends up on my property, who is responsible for diverting it?"</li> </ul> |

#### 4.3.2.1 Performance/Financial Analysis

As stated above, a green waste disposal ban, by itself, does not guarantee the successful diversion from the landfill of the desired quantities of materials. If the County chooses to implement this option, strong consideration would need to be given to the implementation of concurrent, complementary strategies such as:

- Ensuring the public understands the reasons for/benefits of the ban;
- Enforcement of the ban;
- Building widespread support among key stakeholders for the ban;
- Dissemination of public information on the alternatives to disposal of green waste;
- Expansion of green waste collection opportunities, either through additional drop-off sites and/or provision of curbside collection;
- Expansion of green waste processing capacity; and,
- Promotion of the beneficial uses and markets for processed green waste.

It should be noted that existing programs and strategies are already capturing almost 70 percent of the green waste generated in Kaua'i. The County should consider whether a mandatory (with a green waste disposal ban) or a voluntary (without the ban) approach is the most appropriate to divert the green waste that currently remains in the waste stream.

**Comment [a2]:** This number may be higher when we get figures from private sector.

The most significant financial implications of a green waste ban are not necessarily related directly to the ban, per se, but to the supporting programs and strategies that would need to be implemented. Costs will be discussed in the following sections, in the context of the specific strategies that might be implemented, regardless of whether or not a ban is instituted.

### 4.3.3 Provide Additional Drop-off Capacity or Sites for Green Waste

Since the existing drop-off sites are near or at capacity for handling current levels of green waste, substantial increases in diversion will require further actions to accept the additional materials.

Short term, some additional capacity might be achieved by increasing the frequency of grinding at the drop-off sites. This would reduce the volume of the materials and require a smaller footprint for storage. Also the existing transfer stations could be reconfigured to include a separate loading location for green waste. Residents could deposit green waste directly into a transfer trailer or roll-off container. The green waste could then be transported off site for processing.

Although the short-term actions could help, the provision of additional drop-off sites may still be necessary. Not only would they provide additional capacity to handle increased quantities, they would increase the convenience to the public by reducing the travel distance to use them.

The implementation of additional green waste drop-off sites would:

- ☒ Increase diversion of materials from the Landfill;
- ☒ Minimize costs (Possibly – if the cost to divert green waste is less to the County than collecting and disposing green wastes);
- ☒ Promote sustainability;
- ☒ Facilitate the development of small businesses (if grinding services are contracted);
- ☒ Further protect the environmental health of the County; or
- ☒ Increase participation.

Table 4-4  
Strengths and Weaknesses of Strategy  
Additional Green Waste Drop-off Sites

| Strengths | Weaknesses |
|-----------|------------|
|           |            |



Table 4-4  
Strengths and Weaknesses of Strategy  
Additional Green Waste Drop-off Sites

| Strengths   | Weaknesses  |
|---|---|
| <ul style="list-style-type: none"> <li>Would be more convenient for citizens.</li> <li>Could increase participation and diversion.</li> <li>Would relieve congestion at existing drop-off sites.</li> </ul> | <ul style="list-style-type: none"> <li>Availability of the proper size of land parcels with an appropriate land use.</li> <li>Siting of new locations could be resisted by nearby residents or property owners.</li> <li>Would likely require new capital investment in land (if other alternatives are not available).</li> <li>Would require additional operating costs.</li> </ul> |

#### 4.3.3.1 Performance/Financial Analysis

Based on the dual goals of reducing congestion at the existing sites and accommodating of the potential growth in green waste generation and diversion, the County would need to consider adding new drop-off sites during the next fifteen years. This estimate is based upon the following assumptions:

- The existing five sites handle approximately 12,000 tons per year, an average of 2,400 tons per site (if usage is allocated equally among the sites);
- Frequency of processing – grinding the green waste into mulch – and the rate of outflow (use of the finished product) would remain unchanged;
- The amounts of green waste diverted will increase in the future, due to population increases and other factors that affect generation; and,
- Curbside collection of green wastes is not available.

Table 4-5 shows the projected increases in green waste generation, diversion and disposal for the period 2005 – 2020. The projections in Table 4-5 reflect the island's anticipated growth, but do not assume any increases in the rate of diversion (the diversion quantities increase due to population increases). For example, the approximate quantity of green waste generated in 2005 was slightly less than 17,000 tons, with almost 12,000 tons diverted and slightly more than 5,000 tons disposed. By 2020, the generation amount is expected to top 32,000 tons. Of that amount, 15,000 tons are projected to be diverted by 2020, due only to population growth. Disposal is also expected to grow, in the absence of any additional diversion measures, to more than 17,000 tons by 2020.

Table 4-5

Projected Green Waste Generation, Diversion, and Disposal Quantities, 2005 – 2020

| Year | Green Waste Generated | Green Waste Diverted | Green Waste Disposed |
|------|-----------------------|----------------------|----------------------|
| 2005 | 16,990                | 11,650               | 5,340                |
| 2006 | 17,750                | 11,850               | 5,900                |
| 2007 | 18,530                | 12,050               | 6,480                |
| 2008 | 19,350                | 12,260               | 7,090                |
| 2009 | 20,220                | 12,480               | 7,740                |
| 2010 | 21,110                | 12,690               | 8,420                |
| 2011 | 22,040                | 12,910               | 9,130                |
| 2012 | 23,010                | 13,130               | 9,880                |
| 2013 | 24,010                | 13,340               | 10,670               |
| 2014 | 25,080                | 13,580               | 11,500               |
| 2015 | 26,180                | 13,800               | 12,380               |
| 2016 | 27,330                | 14,040               | 13,290               |
| 2017 | 28,520                | 14,270               | 14,250               |
| 2018 | 29,750                | 14,500               | 15,250               |
| 2019 | 31,050                | 14,740               | 16,310               |
| 2020 | 32,440                | 15,000               | 17,440               |

If a green waste disposal ban were to be enacted and take full effect in 2008, this projection estimates that approximately 7,090 tons of additional green waste could be diverted in that year. Table 4-5 also projects that the total diversion quantity would grow to approximately 32,000 tons by 2020. Please note that actual diversion following a disposal ban would probably be less than the total generated amounts, due to such factors as on-site/backyard composting, non-compliance, and some green waste contaminated with solid waste.

One response to these additional tonnages is to establish additional green waste drop-off sites, since the transfer stations may not have the space to accept additional green waste. Assuming that the current average annual quantity of material of 2,400 tons per site is the maximum, the number of additional drop-off sites can be estimated to accommodate the projected growth in diversion. To do this, the amount of green waste that would need to be managed based on a status quo diversion rate of 0.14 per capita per year and a total diversion of all green waste that is generated (0.20 per capita per year) was calculated for each of the island's five planning districts. The results are displayed in Tables 4-6 through 4-10.

Table 4-6  
North Shore  
Projected Need for Green Waste Drop-off Sites

| Year | With No Additional Diversion Measures |                                 | With Green Waste Disposal Ban in 2008 |                                 |
|------|---------------------------------------|---------------------------------|---------------------------------------|---------------------------------|
|      | Green Waste Diverted                  | Number of Drop-off Sites Needed | Green Waste Diverted                  | Number of Drop-off Sites Needed |
| 2005 | 1,850                                 | 1                               | 1,850                                 | 1                               |
| 2006 | 1,870                                 | 1                               | 1,870                                 | 1                               |
| 2007 | 1,880                                 | 1                               | 1,880                                 | 1                               |
| 2008 | 1,900                                 | 1                               | 3,000                                 | 1                               |
| 2009 | 1,910                                 | 1                               | 3,100                                 | 1                               |
| 2010 | 1,930                                 | 1                               | 3,210                                 | 1                               |
| 2011 | 1,950                                 | 1                               | 3,330                                 | 1                               |
| 2012 | 1,960                                 | 1                               | 3,440                                 | 1                               |
| 2013 | 1,980                                 | 1                               | 3,560                                 | 1                               |
| 2014 | 1,990                                 | 1                               | 3,680                                 | 2                               |
| 2015 | 2,010                                 | 1                               | 3,810                                 | 2                               |
| 2016 | 2,020                                 | 1                               | 4,040                                 | 2                               |
| 2017 | 2,040                                 | 1                               | 4,080                                 | 2                               |
| 2018 | 2,060                                 | 1                               | 4,220                                 | 2                               |
| 2019 | 2,070                                 | 1                               | 4,370                                 | 2                               |
| 2020 | 2,090                                 | 1                               | 4,520                                 | 2                               |

Table 4-7  
Kawaihau  
Projected Need for Green Waste Drop-off Sites

| Year | With No Additional Diversion Measures |                                 | With Green Waste Disposal Ban in 2008 |                                 |
|------|---------------------------------------|---------------------------------|---------------------------------------|---------------------------------|
|      | Green Waste Diverted                  | Number of Drop-off Sites Needed | Green Waste Diverted                  | Number of Drop-off Sites Needed |
| 2005 | 3,810                                 | 2                               | 3,810                                 | 2                               |
| 2006 | 3,820                                 | 2                               | 3,820                                 | 2                               |
| 2007 | 3,830                                 | 2                               | 3,830                                 | 2                               |
| 2008 | 3,840                                 | 2                               | 6,063                                 | 3                               |
| 2009 | 3,850                                 | 2                               | 6,242                                 | 3                               |
| 2010 | 3,860                                 | 2                               | 6,426                                 | 3                               |
| 2011 | 3,880                                 | 2                               | 6,617                                 | 3                               |
| 2012 | 3,890                                 | 2                               | 6,810                                 | 3                               |
| 2013 | 3,900                                 | 2                               | 7,011                                 | 3                               |
| 2014 | 3,910                                 | 2                               | 7,217                                 | 3                               |
| 2015 | 3,920                                 | 2                               | 7,430                                 | 3                               |
| 2016 | 3,930                                 | 2                               | 7,855                                 | 3                               |
| 2017 | 3,940                                 | 2                               | 7,874                                 | 3                               |
| 2018 | 3,950                                 | 2                               | 8,108                                 | 3                               |
| 2019 | 3,960                                 | 2                               | 8,347                                 | 3                               |
| 2020 | 3,970                                 | 2                               | 8,592                                 | 4                               |

Table 4-8  
Lihue  
Projected Need for Green Waste Drop-off Sites

| Year | With No Additional Diversion Measures |                                 | With Green Waste Disposal Ban in 2008 |                                 |
|------|---------------------------------------|---------------------------------|---------------------------------------|---------------------------------|
|      | Green Waste Diverted                  | Number of Drop-off Sites Needed | Green Waste Diverted                  | Number of Drop-off Sites Needed |
| 2005 | 1,910                                 | 1                               | 1,910                                 | 1                               |
| 2006 | 1,970                                 | 1                               | 1,970                                 | 1                               |
| 2007 | 2,020                                 | 1                               | 2,020                                 | 1                               |
| 2008 | 2,080                                 | 1                               | 3,280                                 | 1                               |
| 2009 | 2,140                                 | 1                               | 3,470                                 | 1                               |
| 2010 | 2,210                                 | 1                               | 3,670                                 | 2                               |
| 2011 | 2,270                                 | 1                               | 3,880                                 | 2                               |
| 2012 | 2,340                                 | 1                               | 4,100                                 | 2                               |
| 2013 | 2,410                                 | 1                               | 4,330                                 | 2                               |
| 2014 | 2,480                                 | 1                               | 4,580                                 | 2                               |
| 2015 | 2,550                                 | 1                               | 4,840                                 | 2                               |
| 2016 | 2,630                                 | 1                               | 5,250                                 | 2                               |
| 2017 | 2,700                                 | 1                               | 5,400                                 | 2                               |
| 2018 | 2,790                                 | 1                               | 5,720                                 | 2                               |
| 2019 | 2,870                                 | 1                               | 6,050                                 | 3                               |
| 2020 | 2,960                                 | 1                               | 6,400                                 | 3                               |

Table 4-9  
Koloa-Poipu-Kalaheo  
Projected Need for Green Waste Drop-off Sites

| Year | With No Additional<br>Diversion Measures |  | With Green Waste Disposal Ban<br>in 2008 |                                       |
|------|--|--|--|---------------------------------------|
|      | Green<br>Waste<br>Diverted               | Number of<br>Drop-off<br>Sites<br>Needed | Green Waste<br>Diverted                  | Number of<br>Drop-off Sites<br>Needed |
| 2005 | 2,960                                    | 1  | 2,960                                    | 2                                     |
| 2006 | 3,040                                    | 1  | 3,040                                    | 2                                     |
| 2007 | 3,130                                    | 1  | 3,130                                    | 2                                     |
| 2008 | 3,210                                    | 1  | 5,070                                    | 2                                     |
| 2009 | 3,310                                    | 1  | 5,360                                    | 2                                     |
| 2010 | 3,400                                    | 1  | 5,650                                    | 2                                     |
| 2011 | 3,490                                    | 1  | 5,960                                    | 2                                     |
| 2012 | 3,590                                    | 1  | 6,290                                    | 3                                     |
| 2013 | 3,680                                    | 2  | 6,630                                    | 3                                     |
| 2014 | 3,790                                    | 2  | 7,000                                    | 3                                     |
| 2015 | 3,890                                    | 2  | 7,380                                    | 3                                     |
| 2016 | 4,000                                    | 2  | 8,000                                    | 3                                     |
| 2017 | 4,120                                    | 2  | 8,230                                    | 3                                     |
| 2018 | 4,230                                    | 2  | 8,680                                    | 4                                     |
| 2019 | 4,350                                    | 2  | 9,160                                    | 4                                     |
| 2020 | 4,470                                    | 2  | 9,670                                    | 4                                     |

Table 4-10  
West Side  
Projected Need for Green Waste Drop-off Sites

| Year | With No Additional Diversion Measures |                                 | With Green Waste Disposal Ban in 2008 |                                 |
|------|---------------------------------------|---------------------------------|---------------------------------------|---------------------------------|
|      | Green Waste Diverted                  | Number of Drop-off Sites Needed | Green Waste Diverted                  | Number of Drop-off Sites Needed |
| 2005 | 1,110                                 | 1                               | 1,110                                 | 1                               |
| 2006 | 1,120                                 | 1                               | 1,120                                 | 1                               |
| 2007 | 1,140                                 | 1                               | 1,140                                 | 1                               |
| 2008 | 1,150                                 | 1                               | 1,820                                 | 1                               |
| 2009 | 1,170                                 | 1                               | 1,890                                 | 1                               |
| 2010 | 1,180                                 | 1                               | 1,960                                 | 1                               |
| 2011 | 1,200                                 | 1                               | 2,040                                 | 1                               |
| 2012 | 1,210                                 | 1                               | 2,120                                 | 1                               |
| 2013 | 1,220                                 | 1                               | 2,200                                 | 1                               |
| 2014 | 1,240                                 | 1                               | 2,290                                 | 1                               |
| 2015 | 1,250                                 | 1                               | 2,380                                 | 1                               |
| 2016 | 1,270                                 | 1                               | 2,540                                 | 1                               |
| 2017 | 1,290                                 | 1                               | 2,580                                 | 1                               |
| 2018 | 1,310                                 | 1                               | 2,680                                 | 1                               |
| 2019 | 1,320                                 | 1                               | 2,780                                 | 1                               |
| 2020 | 1,340                                 | 1                               | 2,890                                 | 1                               |

In summary, the growth of the island (without any additional diversion measures) may create a need for a three additional drop-off sites during the next fifteen years. However, a potential green waste disposal ban, if in effect in 2008, could create the need for approximately eight (including those needed to accommodate growth) additional drop-off sites throughout the County at that time.

The number of additional sites needed could change, based on a number of factors:

- Actual usage at the individual sites rather than average use;
- Quantity of additional green waste diversion that would come to the sites. This would be affected by source reduction and at-home or business composting, acceptance of materials at privately owned processors/composters, and whether/when a disposal ban were to be enacted;
- Degree to which frequency of grinding and rate of outflow of finished product affects storage space requirements; and,
- Whether or not curbside collection of green waste is implemented.

The costs associated with increasing the number of drop-off sites for green waste would depend on several factors including:

- The cost to purchase or lease land for a site if the County doesn't own it;
- Site preparation (if necessary);
- Level of staffing and hours of operation; and,
- The frequency of processing required at each site (based on quantities anticipated).

### 4.3.4 Establish Curbside Collection of Green Waste

As the County's population increases and it becomes more urbanized, the practice of self-hauling green waste to drop-off sites may become less prevalent. That will also likely lead to a growing demand for curbside collection. As has been shown, the amounts of green waste generated, diverted and disposed are expected increase during the next fifteen years, even if no additional diversion measures are implemented. Curbside collection is one management approach that can be considered to address these growing amounts.

The curbside collection of green waste in Kaua'i can be considered by examining a number of factors that directly affect any program that might be implemented. Those factors include:

- Eligibility for Service – Determine to whom the service will be offered. If residential only, are apartments included? Will there be size limitations on the apartments (for example, should large apartment complexes be excluded?) Currently, collections of solid waste by the County are extended to single family homes and some small apartment buildings. If commercial establishments are included, will there be limitations (for example, include small businesses, but not large, apartment complexes)?
- Frequency of Collection – The County's solid waste collection service is offered on a weekly basis. How often should green waste customers be serviced? Collection frequencies for green waste typically range from weekly to every-other-week to monthly. Some jurisdictions simply provide quarterly collections of brush and tree trimmings. Factors affecting the collection frequency include the rate of generation, green waste storage capacity between collections, and cost.
- Types/Size of Materials Collected – Are virtually all types of green waste appropriate to include, or are there any restrictions that should be included in the program? For example, size limitations are typically placed on logs/tree trimmings. Any restrictions required by the composting facility will need to be considered as well. These restrictions are not unlike the waste collection rules that are currently in place for solid waste collection.
- Containers – What types and sizes of containers will be allowed in the program? Again, like the County's existing rules concerning solid waste containers, rules governing the containers used (or prohibited) in the green waste program will need to be defined. Typically, green waste collection operations will strictly



prohibit the use of plastic bags, because the bags are not compostable and contaminate the material. They must be emptied and removed at the composting facility in a very costly time-consuming process. Many communities make available to their customers the wheeled carts with attached lids (available in 30-60-90 gallon sizes). This gives the resident the ability to properly store green waste between collections. In addition, other communities might give residents a choice of using a cart, biodegradable kraft paper bags designed specifically for green waste use, or their own reusable containers. Brush and tree trimmings are typically bundled with twine (no wire).

- **Method of Collection and Type of Collection Vehicle** – There are three approaches: manual, semi-automated, or fully-automated. In all three cases, a type of garbage truck is used, but it is clearly marked as a green waste collection vehicle. This is to reinforce to the residents that the materials are not going to the landfill, but instead will be recycled.

*Manual Collection* – This involves the use of a regular trash truck – a rear or side loading compactor – which is manually loaded by its crew. The carts described above cannot be accommodated in this method, since they are too large and heavy.

*Semi-automated collection* – This approach uses the same type of trash truck, but is equipped with mechanical lifters that permit the carts to be used. Collection personnel roll the carts from the curbside to the hopper of the truck and the mechanical lifter empties the cart.

*Fully-automated Collection* – A fully-automated collection involves a one-person, specially designed truck that picks up the cart and empties it into the truck. The truck is equipped with an articulated arm that is controlled by the driver in the cab. The driver maneuvers the truck and its arm to reach out to the curbside, where the arm grasps the cart and empties it into the truck. The arm returns the cart to the curbside and the driver continues to the next service location.

- **Composting Facility** – Where will the collected green wastes be taken? An island-wide curbside collection of green waste will necessitate having a composting facility operational to accept and process the daily loads. As will discussed in the next part of this section, the County could, among other options, develop its own facility or contract with existing composters to accept the materials. The feasibility of using existing composting facilities will also need to be evaluated
- **Public Information** – The implementation of a new collection program will need to be communicated effectively to the public. Citizens will need to be informed as to how to properly participate – collection schedule, containers to use, how to prepare materials for collection and other rules of the program, who to call, etc. This is very similar to the types of public information activities currently being performed by the County's Recycling Coordinator.
- **Service Provider** – Decisions will need to be made concerning who will provide the collection service. County Solid Waste employees could provide the service in-house, or the County could take bids from private haulers to provide the service

under contract. These options were described previously in the Recycling part of this section.

- Payment for Service – How will the service be paid for? Options include using the general funds of the County, fees/assessment per property owner, or as part of a PAYT system (also previously described in the Recycling section).

R. W. Beck recommends that the County consider the following approach to collect green waste. For the short-term (1-3 years), continue to operate the drop-off sites for green waste. Mid-term (4-6 years), monitor the growth of the County and gauge the interest in curbside collection. Implementation could begin using a manual system, to minimize the capital investment needed. Offer the curbside collection on a fee basis, but keep some or all of the drop-off sites to provide a no-charge alternative to residents. One approach to accomplishing this is to use the rear loader packer trucks for green waste if the decision is made to automate the solid waste collection operations. As the curbside collection becomes more popular, consider the phasing-out of more of the drop-off sites

Longer term, green waste curbside collection could be an integral part of a comprehensive PAYT system, whereby residents pay for trash collection, but are encouraged to reduce waste by providing no-charge recycling and green waste collection services.

The provision of curbside collection of green waste would:

- ☒ Increase diversion of materials from the Landfill;
- ☐ Minimize costs;
- ☒ Promote sustainability;
- ☒ Facilitate the development of small businesses;
- ☒ Further protect the environmental health of the County; or
- ☒ Increase participation.

Table 4-11  
Strengths and Weaknesses of Strategy  
Curbside Collection of Green Waste

| Strengths   | Weaknesses   |
|---|--|
| <ul style="list-style-type: none"> <li>Most convenient method for citizens.</li> <li>Strategy most likely to increase participation and diversion of green waste from the landfill.</li> <li>Would provide a long term sustainable strategy, when combined with the use of a central composting facility, for managing the island's green waste.</li> <li>Would resolve the congestion problems at the existing drop-off sites.</li> <li>Offers potential for adding the collection of other compostable organics (food waste, non-recyclable paper) in the future, further increasing landfill diversion.</li> <li>If the space allocated to green waste drop-off sites were reduced, more space would be available for drop-off recycling.</li> </ul> | <ul style="list-style-type: none"> <li>Would require capital investment and operating costs.</li> <li>Would require the development of (or long term commitment to use) a composting facility.</li> <li>Would increase collection vehicle traffic on the island. However, because traffic to the drop-off sites would be minimized, overall truck would be reduced</li> <li>New collection program would require additional public information efforts.</li> </ul> |

#### 4.3.4.1 Performance/Financial Analysis

Projecting Kaua'i's costs for a new curbside collection of green waste would be dependent on the factors described at the beginning of this section. However, the City and County of Honolulu recently estimated its costs for performing manual curbside collection of green waste<sup>4</sup>. These costs provide a frame of reference that can be used to estimate an approximate, order-of-magnitude program cost for Kaua'i.

For manual collection operations in 2005 serving 50,000 households twice per month, Honolulu estimated that they spent approximately \$1,198,100 to collect green waste. This collection cost includes expenditures for labor, maintenance and amortized vehicle costs. That is a rate per household of \$23.96 per household per year; \$2.00 per household per month.

In addition, Honolulu reported a composting cost of \$400,000 for 2005. They paid \$50 per ton to a private composter to process 8,000 tons.

An estimated order-of-magnitude cost for a Kaua'i green waste curbside collection can be derived by applying the Honolulu per-household annual collection cost rate of \$2.00/hh/month to the estimated number of households in Kaua'i (20,183 in the 2000

<sup>4</sup> Source: City and County of Honolulu Refuse Division, c/o S. Serikaku

Census). This results in an estimated cost of approximately \$483,600, not including the cost to process the materials. Again, the development of a more detailed cost estimate for a Kaua'i green waste curbside collection program is dependent on analysis of the factors described at the beginning of this section.

### 4.3.5 Establish Central Organic Waste Processing Facility

If curbside collection is offered at no charge to the resident, it could eventually reduce the need for green waste drop-off sites and create a need for an efficient processing site to which the materials could be taken by the collection vehicles. Closure of the existing green waste drop-off sites would enable the County to avoid the time and expense of either:

- Double-handling green waste received at drop-offs and then transporting it to the central processing facility; or
- Investing in the central processing facility and also in grinding services at other drop-off sites.

Note that if a central processing facility was developed and the existing drop-off sites closed (replaced by curbside collection), the central processing facility could be designed to also accept self-hauled green waste and possibly other organics such as food waste, which is 14.6 percent of the overall waste stream according to the waste characterization.

A central organics waste processing facility would:

- ☒ Increase diversion of materials from the Landfill;
- ☐ Minimize costs (Possibly, if composting organics is less than disposing these materials);
- ☒ Promote sustainability;
- ☒ Facilitate the development of small businesses;
- ☒ Further protect the environmental health of the County; or
- ☒ Increase participation.

Table 4-12  
Strengths and Weaknesses of Strategy  
Central Organics Waste Processing Facility

| Strengths  | Weaknesses  |
|--|---|
| <ul style="list-style-type: none"> <li>Would provide long term processing capacity for the island's generation of organic wastes, including food waste.</li> <li>Would likely lead to increased landfill diversion if combined with the curbside collection of green waste.</li> <li>Provides a sustainable method for turning waste materials into beneficial products.</li> <li>Would resolve the congestion problems at the existing green waste drop-off sites.</li> <li>Offers the potential for generating revenues.</li> <li>Offers potential for composting municipal solid waste organics with biosolids, facilitating further landfill diversion.</li> </ul> | <ul style="list-style-type: none"> <li>Requires significant capital investment and operating costs.</li> <li>Could require special handling and equipment to receive and process organics other than green waste.</li> <li>Requires staff with specialized knowledge and experience in producing compost.</li> <li>Would likely require the implementation of curbside collection of green waste.</li> <li>Potential source of nuisance odors (especially with food waste), dust, and other environmental problems if not operated properly</li> <li>Potentially difficult to find a large, suitable tract of land.</li> <li>Could be resisted by neighbors of the potential site.</li> </ul> |

#### 4.3.5.1 Performance/Financial Analysis

As will be described later in the part of this section titled "Additional Drop-off Sites", this analysis assumes an incoming quantity of green waste materials<sup>5</sup> ranging from approximately 12,000 tons/year at current levels to 32,000 tons/year by 2020, if a green waste ban is enacted. Based on current diversion rates of 0.14 tons per capita, approximately 15,000 tons of green waste could be anticipated by 2020.

The costs related to a central composting facility can be identified in two components: development (capital) and operating. Please note that these are planning level order-of-magnitude cost estimates. They illustrate the capital and operating costs to develop and run a typical windrow composting facility that can receive and process green waste, producing both mulch and compost products.

*Capital Costs* – The capital investment required to develop a facility is shown in Table 4-13. Please note that the total capital cost identified in the table does not include the cost of land acquisition.

<sup>5</sup> Other organic materials will be discussed later in this section.

Table 4-13  
Capital Costs to Develop Central Composting Facility  
(Without Land Cost)

| Equipment        | Purchase Price        | Amortization Period | Annualized Cost <sup>1</sup> |
|------------------|-----------------------|---------------------|------------------------------|
| Concrete Pad     | \$ 60,000             | 10                  | \$7,637                      |
| Engineered Site  | \$100,000             | 20                  | \$7,920                      |
| Windrow Turner   | \$ 300,000            | 7                   | \$50,882                     |
| Tub Grinder      | \$ 600,000            | 10                  | \$76,367                     |
| Skid Loader      | \$ 35,000             | 6                   | \$6,764                      |
| Bucket Loader    | \$ 200,000            | 6                   | \$38,652                     |
| Power Screen     | \$ 190,000            | 7                   | \$32,225                     |
| Dump Truck       | \$140,000             | 10                  | \$17,819                     |
| Storage Building | <u>\$40,000</u>       | 10                  | \$5,091                      |
| <b>Total</b>     | <b>\$1,665,000.00</b> |                     | <b>\$243,357</b>             |

<sup>1</sup> 5 percent interest rate

These costs are based on the development of a typical facility in the mainland, but have been adjusted<sup>6</sup> to reflect the higher costs of shipping new equipment to the islands. The actual costs will vary based on such factors as the type and size of equipment that is specified, purchase of new equipment versus using existing equipment, number of acres needed, and the cost of land.

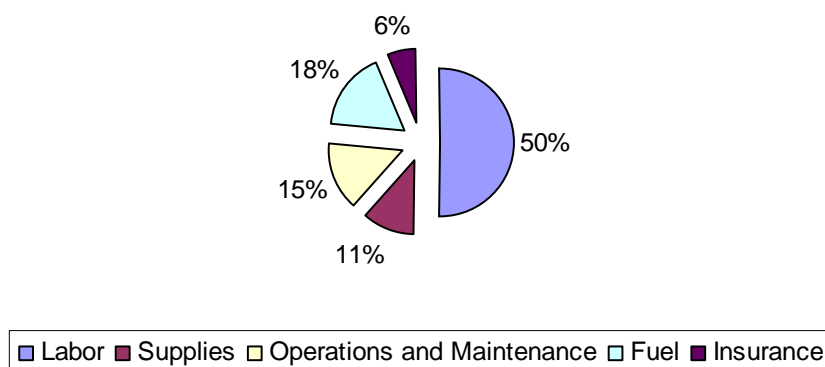
*Operating Costs* – Based on R. W. Beck's experience, operating costs for a composting facility typically include the following:

- Labor;
- Supplies;
- Operations and maintenance;
- Fuel; and,
- Insurance.

As shown in Figure 4-1, labor costs are a significant portion of a composting facility's operating costs. In addition, the annualized cost of the capital investment can also be quite significant, depending on the cost and availability of land, and the decisions made concerning equipment needed.

<sup>6</sup> Equipment costs were based on input from R. Westmoreland, Regional Manager of Mehehune Green Composting near Honolulu, who provided current cost estimates to acquire such equipment in the islands.

Figure 4-1  
Percentage of Operating Cost



As mentioned in the earlier discussion of curbside collection, Honolulu's composting contractor charges them \$50 per ton to process the delivered green waste. While this amount does not indicate what Kaua'i's costs might be to do its own composting, it does provide a frame of reference.

As is the case with the capital costs, the operating costs could vary based on (among other factors) the numbers and levels of personnel actually deployed, fuel prices, the number of tons of materials processed, maintenance and repair experience, and environmental compliance requirements.

If the County decides to pursue the concept of developing a central composting facility, R. W. Beck recommends gathering more information concerning the following elements of the planning, development, operation and procurement of a composting facility. In addition, the project's cost estimates will need to be reviewed and revised after gathering that more in-depth information.

#### 4.3.5.2 Potential Feedstock Materials for Composting Facility

In addition to green waste, the County could consider the composting of additional organics, such as food waste, non-recyclable paper and biosolids. According to the recent waste characterization study for Kaua'i, food waste represents approximately 14 percent (approximately 12,000 tons) and non-recyclable paper (such as food containers, paper towels, etc.) represents 8 percent (approximately 6,700 tons) of the municipal solid waste currently going into the landfill. The generators of these materials are from residential and commercial sources combined. Table 4-14 shows approximations of the break-out of 2005 tonnages between residential and commercial sources.

**Table 4-14**  
**Approximate Proportions of Certain Organics Being**  
**Disposed, by Source of Generation**

| Source      | Food Waste |         | Non-Recyclable Paper |         |
|-------------|------------|---------|----------------------|---------|
|             | Tons       | Percent | Tons                 | Percent |
| Residential | 5,750      | 48      | 2,860                | 43      |
| Commercial  | 6,330      | 52      | 3,830                | 57      |
| Total       | 12,080     | 100     | 6,690                | 100     |

NOTE: Tons do not correspond exactly with tonnages from the Waste Characterization Study, due to rounding.

While the generators of the food waste being disposed are approximately one-half each residential and commercial, the commercial sector is generating a larger proportion, 57 percent, of the non-recyclable paper. The combined amount of almost 18,770 tons represents approximately 22 percent of the municipal solid waste currently being landfilled. In addition, 1,380 tons of sewage sludge were landfilled in 2005.

As was the case with green waste, the quantities of these materials being disposed are expected to increase during the planning period<sup>7</sup>. Table 4-15 shows the disposal quantities that are projected for the years 2005 – 2020.

**Table 4-15**  
**Projected Disposal Quantities for Food Waste,**  
**Compostable Paper, and Biosolids, 2005- 2020**  
**(TPY)**

| Year | Food Waste Disposed | Non-Recyclable Paper Disposed | Biosolids Disposed |
|------|---------------------|-------------------------------|--------------------|
| 2005 | 12,187              | 6,761                         | 1,380              |
| 2006 | 12,747              | 7,062                         | 1,441              |
| 2007 | 13,330              | 7,374                         | 1,505              |

<sup>7</sup> The same methodology used to project total generation, recycling and disposal quantities, as described in Section 2, were used for these projections.



Table 4-15  
Projected Disposal Quantities for Food Waste,  
Compostable Paper, and Biosolids, 2005- 2020  
(TPY)

| Year | Food Waste<br>Disposed | Non-<br>Recyclable<br>Paper<br>Disposed | Biosolids<br>Disposed |
|------|------------------------|---|-----------------------|
| 2008 | 13,934                 | 7,698                                   | 1,571                 |
| 2009 | 14,577                 | 8,043                                   | 1,642                 |
| 2010 | 15,245                 | 8,401                                   | 1,715                 |
| 2011 | 15,938                 | 8,772                                   | 1,790                 |
| 2012 | 16,657                 | 9,157                                   | 1,869                 |
| 2013 | 17,404                 | 9,556                                   | 1,950                 |
| 2014 | 18,196                 | 9,979                                   | 2,037                 |
| 2015 | 19,019                 | 10,419                                  | 2,127                 |
| 2016 | 19,873                 | 10,875                                  | 2,220                 |
| 2017 | 20,759                 | 11,348                                  | 2,316                 |
| 2018 | 21,678                 | 11,838                                  | 2,416                 |
| 2019 | 22,652                 | 12,358                                  | 2,522                 |
| 2020 | 23,685                 | 12,909                                  | 2,635                 |

These projections show a significant potential for increasing diversion, with the amounts nearly doubling by 2020. The inclusion of any of these other organic materials in a potential composting facility will have an impact on, among other things, the size of the facility, the composting methods and equipment used, and the qualities of the final compost product. The co-composting of green waste and biosolids will be discussed further in Section 5.

#### 4.3.5.3 Predevelopment and Site Design

*Site Size* – Verify the acreage needed;

*Site Selection* – Determine general availability of properly sized land parcels; apply site selection criteria based on state<sup>8</sup> and local laws/rules and other requirements (such as input from stakeholders); examine the topography and drainage characteristics; surrounding land uses; access to site; availability of water supply; and

*Site Design Requirements* – Considering environmental regulatory requirements, operational needs, and stakeholder input, determine requirements for windrow size

<sup>8</sup> Hawai'i Administrative Rules, Title 11, Department of Health, Solid Waste Management Control: SUBCHAPTER 4 - SOLID WASTE RECLAMATION FACILITIES §11-58.1-41 Composting facilities.

and configuration, storage space, buffer zone, and overall site layout, including gates, driveways, surface type and size, signs, etc.

### 4.3.5.4 Operational Planning

*Processing Methods* – Estimate quantities and characteristics of incoming loads and decide which type(s) of processing are appropriate for the end uses of the finished products. For example, a mulch product might need only grinding, or it might also require screening to produce a higher quality product. Similarly, if compost products will be produced, the mix of nitrogen and carbon based feedstock will need to be considered, as will the requirements for moisture, pH, temperature, aeration/turning, and finishing. The overall site layout will be affected by these decisions, particularly the receiving, staging, and processing areas.

*End Uses/Distribution of Finished Products* – As mentioned above, the intended end uses for the mulch or compost products will impact how the materials are processed. The rate of outflow of the finished products will also directly affect the site's size requirements. Further, the production of high quality products could impact the economics of the project, if it is possible to market them. A survey of the market conditions for compost and mulch products would help determine the feasibility of selling them.

### 4.3.5.5 Procurement Approaches

In addition, the County also could consider alternative approaches to the development and operations of the facility, including:

- Developed, owned and operated by the County – The County would site and acquire the land, if necessary, and would develop, own and operate the facility;
- Developed and owned by the County and operated by a private contractor – Same as above, except the County would contract with an experienced private sector firm to operate the County's facility;
- Developed and operated by a private contractor through a contract with the County – A full-service approach, whereby the County would contract with a private firm for the development and operation of a composting facility; or
- Other public-private partnerships – This could include contracting with existing private composters and not require the development of a new facility.

## 4.3.6 Facilitate Food Composting at Private Composting Facilities

If using the existing compost facilities is an option which the County wishes to pursue, consideration might be given to a program to provide incentives to the existing private composters to include food waste in their processes.

Currently, the island's private composters are not processing food waste. To encourage them to do so, the County could offer grants to demonstrate the viability of

food waste composting to DOH, and help the composters overcome the challenges that they perceive.

The County could also consider facilitating “matches” between generators of food and the composters. Further, the County could include in this approach an offer to purchase a certain amount of the finished project compost for use in public landscape areas. The purpose of this approach would be to demonstrate the logistical and economic aspects of composting food waste.

The experience of the Center for Ecological Technologies (CET), a not-for-profit environmental organization in Massachusetts, illustrates a similar type of role to encourage the composting of food waste.

#### 4.3.6.1 Building a Market-based System of Farm Composting of Commercial Food Waste in Western Massachusetts<sup>9</sup>

CET completed a three and one-half year project that created a market-based infrastructure for farm composting of commercial food and other organic waste in western Massachusetts. During the project, CET served as a liaison among interested businesses/institutions, haulers and farms willing to accept their organic waste.

Assistance included locating appropriate participants, soliciting their participation and designing or improving organic waste separation, collection, storage, transportation and processing systems. CET reports the following project highlights:

- Over 70 business locations diverted approximately 22,000 tons of organic materials to 7 composting farms, saving valuable disposal capacity and helping the environment;
- Activity will continue as a regular “way of doing business” in the area without on-going assistance;
- Greenhouse gas emissions caused by waste disposal were reduced by approximately 5700 Metric Tons Carbon Equivalent (MTCE);
- Participating businesses collectively saved tens of thousands of dollars;
- Participating farmers and haulers have diversified their businesses and improved sustainability and profitability; and,
- Several industry-led efforts are beginning in the area which may expand the amount of diversion taking place in the near future.

Similar projects conducted by CET with funding from the Massachusetts Department of Environmental Protection, targeted two municipalities. CET worked with the City of Northampton and the Town of Amherst to set up a system of restaurant and school food waste composting. A total of 30 restaurants and 5 schools are composting food waste, non-recyclable paper and waxed cardboard in these two western Massachusetts

<sup>9</sup> Source: Website of the Center for Ecological Technologies

<http://www.cetonline.org/FarmBusiness/farm%20composting.htm#Greater%20Boston%20Project%20Info>

municipalities. Total diversion averages over 8.5 tons per week. The participating businesses report that they achieved a cost avoidance of 20 percent in their trash bills as a result of composting.

The report detailing these (and related efforts) is available online at:  
<http://www.cetonline.org/Publications/publications.htm#composting%20-%20farm%20and%20commercial>.

### 4.3.6 Establish Curbside Collection of Mixed Organics

If a facility to compost organics were available, food waste and non-recyclable paper could potentially be collected at the curbside. In addition, if these organics are added to the program, R. W. Beck recommends the usage of wheeled carts in the program. The carts are sturdy and have attached lids, helping to minimize odor and animal/insect problems that could be encountered during storage of materials between collections and when set-out at the curbside for collection. The carts could be used to hold green waste, food waste and non-recyclable paper.

There are some communities in the U.S. that have begun the collection of other organics as a way to substantially increase the amount of materials that are diverted from disposal. Included for reference are the following case studies that together, provide information about both residential and commercial organics collection operations.

#### San Francisco, California

The City of San Francisco, with help from one of its permitted haulers, Sunset Scavenger Company, developed the City's "Fantastic Three" program. This program provides residents with an opportunity to divert food waste from the landfill, making San Francisco the first major U.S. city to initiate a large-scale curbside collection program for food waste.

The program's impetus was, in part, results of a 1996 waste characterization study that indicated that residents were throwing away 200,000 tons of garbage every year, 30 percent of which was food. The city determined that capturing residential food waste, along with yard trimmings, would help the City meet the State's 50 percent diversion goal.

After several years of various pilot programs, testing different carts, collection vehicles, outreach materials, and demographic variances, the City decided upon the Fantastic Three Program, which consists of:

- One 32-gallon green cart for vegetative waste, soiled papers, and yard waste;
- One 32-gallon blue cart for commingled recyclables; and
- One 32-gallon black cart for refuse.

The vehicle used to collect the materials is a split-body automated collection vehicle. The program, which went Citywide early in 2003, serves all residents and 1,400 businesses. City officials estimate that 50 percent of the residents and 1,400

businesses participate in the program. A total of 300 tons per day of organic material is delivered to Norcal's composting facility. The facility is co-located at the B&J Landfill in Dixon, 65 miles northeast of San Francisco.

Residents, who pay their haulers directly, have an incentive to participate in the program, as each 32-gallon container of refuse is collected for \$22.29 per month, but collection of a 32-gallon container of organic waste is at no extra charge, as is collection of recyclables. Currently businesses receive a reduced (25 percent) rate for compostable waste over trash rates. The tip fee in the San Francisco area is \$100 per ton. A strong market has developed for the end products. The compost is sold at the wholesale and retail levels.

#### Orange County, North Carolina

Orange County, North Carolina implemented a food waste composting program in 1996. The goal of the program was to divert additional organic wastes from the landfill. 20 food waste generators (consisting of restaurants, coffee houses, florists, breweries, grocery stores, and dormitory food service establishments) participated in the program. Businesses in Carrboro and Chapel Hill were offered the service at no charge under the following conditions:

- They participated in the County's commercial glass, metal and plastics recycling program;
- They generated a minimum of two tons per month food waste;
- They had adequate space for the collection containers; and
- They could be serviced by the collection vehicle.

Food waste was placed in either dumpsters or 65-gallon roll carts, for service by a rear loader. Containers were clearly labeled in both English and Spanish, indicating acceptable items. Each business was required to train its employees to comply with the program standards. Participants were encouraged to donate useable food to organizations that help those in need. The contractor collects three days a week from 17 stops (some businesses shared stops, allowing small generators to meet the two-ton minimum by combining waste). The contractor, Brooks, transported the materials to its composting facility, which is located 40 miles from Chapel Hill. The contractor, charged Orange County Solid Waste Division \$55 per ton to collect, and \$20 per ton to process, for the first 1,100 tons collected per year. Brooks waived the processing fee for organics received beyond 1,100 tons.

The Orange County Solid Waste Management Division purchased the compost from the contractor for sale to the citizens of the County. The Division's budget for the program was \$117,000 per year. Based on 1,332 tons of food waste collected per year, this was a cost of \$87.84 per ton. The profits from the sale were used to partially offset program costs.

It should be noted that Kauai presents unique conditions that present challenges to storing food wastes for any length of time, primarily the heat and vectors. Therefore, the County should monitor other programs conducting in communities with similar conditions before instituting a separate collection program for food waste in Kaua'i.

The implementation of additional organics collections could help:

- ☒ Increase diversion of materials from the Landfill;
- ☐ Minimize costs
- ☒ Promote sustainability;
- ☒ Facilitate the development of small businesses;
- ☒ Further protect the environmental health of the County; or
- ☒ Increase participation.

**Table 4-16**  
**Strengths and Weaknesses of Strategy**  
**Additional Organics Collection**

| Strengths   | Weaknesses   |
|---|--|
| <ul style="list-style-type: none"> <li>▪ Offers potential for substantial additional diversion from the landfill to extend its life.</li> <li>▪ Implementation would be eased by adding these organics to an existing collection operation*.</li> <li>▪ Provides a long term sustainable strategy for managing materials in lieu of landfill disposal.</li> </ul> | <ul style="list-style-type: none"> <li>▪ Requires existence of composting facility that can (physically, as well as from a regulatory standpoint) accept and process these additional organics.</li> <li>▪ Would require additional public information program.</li> <li>▪ Could contribute to nuisance odor, litter, or animal problems at collection points, and at the composting facility if the materials were not handled properly.</li> <li>▪ Would require usage of 90 gallon wheeled carts, if not already in use.</li> </ul> |

\*Assuming carts were already being used and that the composting facility could accept the additional organics.

#### 4.3.6.2 Performance/Financial Analysis

As mentioned previously, in the discussion of an organics composting facility, the more than 18,000 tons of food waste and non-recyclable paper represent approximately 22 percent of materials currently going into the landfill. As the island experiences growth over the next fifteen years, the quantities are projected to also grow to as much as 37,000 tons to be disposed in 2020.

If a portion of these materials could be collected and composted (the “capture rate”), there is a potential to add significantly to the County’s diversion efforts. Using 2005 disposal data, Table 4-17 shows that if the capture rate is 10 percent, approximately 1,800 tons could be diverted. If as much as 75 percent could be captured, approximately 13,500 additional tons could be diverted from the landfill.

**Table 4-17**  
**Potential Effect of Additional**  
**Food Waste and Non-Recyclable Paper Collection and Composting**  
**(2005 Disposal Levels)**

| Potential Capture Rate | Approximate Tons Diverted |
|------------------------|---------------------------|
| 10 Percent             | 1,800                     |
| 25 Percent             | 4,500                     |
| 50 Percent             | 9,000                     |
| 75 Percent             | 13,500                    |

In addition to these quantities, the disposal of biosolids is projected to grow from approximately 1,400 tons in 2005 to more than 2,600 tons by 2020. If it is decided to compost biosolids, it is likely that 100 percent of those materials would be recovered.

The costs to add food waste and compostable, non-recyclable paper to a green waste collection are dependent upon a number of factors, including:

- **Carts** – If not already in use, the acquisition of wheeled carts could add a substantial cost. For example, at \$70 each, a purchase of 20,000 carts would cost approximately \$1,400,000;
- **Collection costs** – If the additional organics are added to an existing curbside collection of green waste, using carts, the added collection costs could be minimized, assuming the carts would have sufficient capacity for the additional organics. If the organics collection were targeted toward specific types of commercial generators (for example, restaurants, schools, or grocery stores), the costs could also be contained, compared to County-wide residential service; and,
- **Processing Costs** – Depending on the circumstances at the composting facility, the addition of these materials could increase costs (for example, special handling of incoming loads or more frequent windrow turning).

#### **4.3.7 Further Develop the “Food Waste to Animal Feed” Infrastructure**

The County could further develop the “food waste to animal feed infrastructure” by coordinating and subsidizing a food waste collection program to provide animal feed to local pig and goat farmers. Specifically, the County could educate and encourage commercial and institutional generators of food waste to participate in a food waste diversion program. This would involve a separate collection of organic materials that are suitable for hog or goat feed, and the establishment of working relationships with the farmers who would receive the materials. Targeting specific types of such generators, the County could consider subsidizing the collection operations as an incentive to encourage this diversion. However, an on-going subsidy would be financially difficult to sustain. Consequently, the County should consider taking a demonstration project/technical assistance

approach. A grant could be offered to interested parties to initiate a project that would demonstrate the logistical and financial aspects of a food waste-animal feed diversion effort. The intention would be to demonstrate its feasibility so that it could continue beyond the grant period without governmental funding.

This approach can be considered in the context of two programs that are operating elsewhere in the United States – the State of California and the City of Plano, Texas (Dallas - Ft. Worth area). While the information about the California program sheds little light on the collection process, it does provide useful information about the feeding of food waste to animals. Conversely, the Plano program doesn't involve feeding the food waste to animals. However, it does provide good information on the collection of such materials.

### 4.3.7.1 State of California

In California, the state operates a program that encourages the diversion of food waste as animal feed<sup>10</sup>. Some hog farmers participate in the "Garbage Feeding Program" administered jointly by the U.S. Department of Agriculture (USDA) and the California Department of Food and Agriculture (CDFA). This program requires a license and regular inspections. The collector must heat-treat all post consumer food scraps and food scraps that have been in any contact with meat scraps. At a minimum, the materials must be heated to 212 degrees Fahrenheit for 30 minutes prior to feeding it to swine. This heat treatment prevents potential transmission of diseases such as Trichonella, enteric coliform bacteria, swine fever, and foot and mouth disease. The California Integrated Waste Management Board (CIWMB) cautions that "...Not all food residuals are suitable for animals. For example, no vessel or aircraft waste, whether it is foreign or domestic in origin, should ever be fed to livestock. Serious animal diseases are spread by this illegal practice." The CIWMB also cautions that "... ruminants such as cattle or sheep should not be fed anything containing mammalian protein due to the risk of Bovine Spongiform Encephalitis (BSE), also known as 'Mad Cow Disease.'"

The California program is focused on providing information and regulation, rather than getting directly involved in the establishment of collection programs. The City of Plano, Texas, on the other hand, operates a separate collection of food wastes from commercial and institutional sources. Although it does not provide the food waste for animal feed (it composts it at its own composting facility), their experience in providing the collection service provides information that could be useful to Kaua'i as it considers involvement in this management approach.

### City of Plano, Texas

Plano has operated a commercial and institutional food waste diversion program since 1999. The City provides no-charge collection of both pre- and post-consumer food wastes from more than 100 locations. This includes approximately 30 schools, and a wide variety of businesses and institutions, including restaurants, coffee houses, grocery stores, and larger business cafeteria locations.

---

<sup>10</sup> Source: California Integrated Waste Management Board,  
<http://www.ciwmb.ca.gov/FoodWaste/AnimalFeed/>



Collections are made Monday – Saturday, and pick-ups for participating locations are organized according to their needs. Locations are served daily, every other day, twice per week, or once per week, depending on the quantities of waste that are generated.

The 95-gallon roll carts are used for service collection. Smaller containers are sometimes used to gather the food wastes internally, before placement into the cart. In addition, the City allows the use of two specific brands of biodegradable plastic bags (regular plastic bags are not permitted).

Table 4-18 shows the amount of food waste which Plano has collected and processed since the inception of the program.

**Table 4-18**  
**City of Plano, Texas Food Waste Diversion Program**

| Fiscal Year | Tons Diverted |
|-------------|---------------|
| 2004 – 2005 | 2,758         |
| 2003 – 2004 | 2,464         |
| 2002 – 2003 | 1,872         |
| 2001 – 2002 | 1,211         |
| 2000 - 2001 | 461           |
| 1999 - 2000 | 395           |

The program started out with smaller quantities, until such time the City gained operating experience. In FY 01-02, the City stepped up its marketing and outreach efforts, and the program quantities nearly tripled. The City reports that while they continue to encourage and accept new participants, it is now shifting its priorities to reflect a greater effort to retain existing participants.

The City reports that its program costs are “in the mid-\$50s” per ton for marketing and collection, not including composting costs.

Among the lessons learned by Plano were:

- Cleanliness is initially a big issue. They found that the use of the biodegradable plastic bags for internal collection helped considerably. For those dumping directly into the cart, regular washing out of the cart avoided problems;
- People perceived that problems would be worse than they actually were; and,
- Extra effort is sometimes needed to work out all the logistics on the street level. While the company or organization might agree to the program, they needed to invest time to ensure that the janitorial staff knew what they needed to do and why.

Facilitating a food waste-to-animal feed diversion would:

- ☒ Increase diversion of materials from the Landfill;
- ☒ Minimize costs (Possibly, for the participants)
- ☒ Promote sustainability;

- ☒ Facilitate the development of small businesses;
- ☒ Further protect the environmental health of the County; or
- ☒ Increase participation.

**Table 4-19**  
**Strengths and Weaknesses of Strategy**  
**Food Waste-to-Animal Feed Diversion**

| Strengths  | Weaknesses   |
|--|--|
| <ul style="list-style-type: none"> <li>▪ Encourages increased diversion in the commercial sector.</li> <li>▪ Encourages innovative approaches to diversion by reducing project risk through technical assistance or grant funding.</li> <li>▪ No capital investment required by County.</li> <li>▪ Can document success stories that can be used to encourage others.</li> <li>▪ Provides a long term sustainable strategy for managing materials in lieu of landfill disposal.</li> </ul> | <ul style="list-style-type: none"> <li>▪ Would require staff time to assemble and disseminate technical assistance and to administer a grant program.</li> <li>▪ Relies on voluntary participation by businesses, institutions and farmers.</li> <li>▪ Perceptions of cleanliness problems in storage and collection processes.</li> </ul> |

### Performance/Financial Analysis

A grant program for businesses would require staff time to initiate. First, research would be required on the legality of using public funds to provide market development grants to the private sector. Assuming this approach is legal under Hawai'i law, further development of the program could proceed. This would involve determining the size and focus of the grants, as well as the development of the program's operating procedures (eligibility requirements, grant application forms, schedules/deadlines, selection criteria and process, etc.).

On-going staff time requirements would be less demanding after the initial program is established. Site visits would likely be the most time consuming for the technical assistance. An annual grant cycle would mean increased activity at grant application and award time, but time requirements would be reduced to follow-up monitoring thereafter.

In addition to the grant process, further research on the regulatory requirements, as well as the logistics of a food waste-to-animal feed project would be needed. In addition, outreach to the potential participants in such a project would be needed to generate interest. It might be desirable to convene a working group of stakeholders

who could participate in this research and help conduct a series of forums for interested parties. The purpose would be to help define what the existing and perceived impediments are and to explore what some possibilities might be to move forward.

The benefits of a food waste-to-animal feed project could accrue to several different stakeholders:

- Food waste generators can reduce the amount of material that must be disposed as solid waste and achieve disposal cost avoidance;
- The farmer receiving the food waste gets a beneficial product – needing less animal feed; and,
- The County achieves further diversion of waste from landfill disposal.

## 4.2 Summary

The quantity of potentially recoverable organic materials currently being disposed at the landfill<sup>11</sup> exceeds approximately 25,000 tons per year, including approximately 1,800 tons of sewage sludge/biosolids. This represents almost 30 percent of the disposed waste stream. To increase diversion of organic materials from disposal and increase the landfill's life, R. W. Beck recommends the following strategies be considered by the County:

- **Modify Green Waste Drop-Off Sites.** To address the capacity problems at the drop-offs, the County should first explore the feasibility and cost of increasing the frequency of grinding and removal at the most problematic sites. Next the County should reconfigure the green waste drop-off system to allow residents to deposit green wastes in roll-offs containers or trailers. If this is feasible, it would buy the County some time to consider their plans regarding the implementation of green waste curbside collection. The purpose would be to avoid immediately adding one or more drop-off sites.
- **Assure Adequate and Cost-Effective Composting Capacity.** The County should pursue the following step-wise strategy to ensure that reliable processing capacity will meet their needs:
  1. Work with the two existing composters to determine if they have the existing and future capacity to meet the County's needs, considering projected quantities and types of organic materials (green waste, food waste, non-recyclable compostable paper, and sewage sludge/biosolids).
  2. If existing composters can't feasibly meet the County's projected needs, explore the same with other composters in Hawai'i.

---

<sup>11</sup> Source: Kaua'i Waste Characterization Study, 2005 tonnage for green waste (5,300 tons), food waste (12,000 tons), and non-recyclable compostable paper (6,700 tons).

3. If the private sector does not appear to provide a feasible approach, develop a County-owned composting facility.
- **Move Forward on Facilitating the Food Waste-to-Animal Feed Infrastructure Development.** The County should build on the existing diversion that is currently occurring by establishing a stakeholders working group to expand these efforts. The initial focus should be on researching all applicable laws and regulations and defining best practices to ensure a safe and cost-effective approach.
  - **Expand the Green Waste Disposal Ban Concurrent with Residential Curbside Collection.** As part of the implementation of a green waste curbside collection program, expand the disposal ban on green waste to residentially-generated materials and in-coming loads at the transfer stations.
  - **Provide Residential Curbside Collection of Green Waste.** As the island grows and demographics evolve, the self-hauling of green waste will likely decline and the demand will increase for curbside collection. To prepare for this, the County can consider an integrated approach with the potential automation of its solid waste collection operations. If the County decides to pursue such automation, the labor and equipment that becomes available (as a result of the automation) could be used to establish a separate manual curbside collection of residential green waste (or possibly, of recyclables). The rear-loading trash trucks are ideally suited for green waste collection, and would avoid the need for immediate investment in all new trucks for that purpose.
  - **Defer the Residential Curbside Collection of Food Waste and Non-Recyclable Compostable Paper.** Because of the special needs related to the source separation, collection, and processing of these materials, their inclusion in residential curbside collection should be deferred. Only after wheeled carts with hinged lids are used should these additional materials be considered for such service.